The Files

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HAZARDS ANALYSIS OF UNION CARBIDE NUCLEAR COMPANY'S PROPOSED EXPANSION OF HOT LAB OPERATIONS AT TUXEDO, NEW YORK

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I. Introduction.

The Union Carbide Nuclear Company has requested multikilocurie quantities of byproduct materials, and mixed fission products contained in spent fuel elements plus source and special nuclear materials by an application dated July 10, 1962. They have requested a byproduct material possession limit of 315,000 curies in various forms, including sealed sources, and approximately 420,000 curies of mixed fission products contained in four spent fuel elements. These materials are to be used in a broad program of research and development, for packaging and transfer to licensed recipients, and for gamma irradiation programs. There will be no processing of spent fuel elements in the hot lab facility.

On September 11, 1962, a visit was made to Union Carbide's facility to obtain first-hand information regarding the facility and surrounding area. We met with the appropriate Union Carbide personnel to discuss and clarify the application. Persons present at the meeting were: Union Carbide - D. B. Holzgraf, E. Lieberman, and C. J. Kommerth; New York State Department of Labor - J. Mahle; AEC Region I, Compliance Office - R. Gilbert; and AEC, Headquarters - R. E. Cunningham and G. W. Kerr. Deficiencies in the application were pointed out and additional information was requested on these items. This information was furnished in a letter with attachments dated September 21, 1962, and signed by D. B. Holzgraf.

D. Nussbaumer

II. Facility Description.

A. General Site Area.

Mr. Holzgraf is Superintendent of Operations at this facility, Mr. Lieberman is Supervisor of Hot Lab Operations, and Mr. Kenworth is the Health Physicist. Mr. Holzgraf and Mr. Kenworth conducted us on a tour through the Reactor facility. Mr. Lieberman joined us for the tour of the Hot Lab facility and discussed the operation of the facility.

The Union Carbide facility is located in Sterling Forest, 3½ miles north-northwest of Tuxedo, New York. Sterling Forest is an area of approximately 27 square miles which has been set aside by the owner primarily for technological development, although there is a housing development 1,300 feet east of the reactor - hot lab facility and 1,700 feet from the stack. The area is in rough terrain, rocky, and mostly covered with woods and undergrowth. The population density within a 10-mile radius is approximately 300 persons/square mile, but within a 2-mile radius is approximately 50 persons/square mile (Martin-Marietta's Quehanna, Pennsylvania, Strontium 90 processing facility has a population density of approximately 30 persons/square mile within a 25-mile radius).

Although the reactor building is a separately contained facility, it is physically connected to the hot laboratory building. The reactor is a 5 megawatt swimming pool reactor used for research by Union Carbide Nuclear Company for the various divisions of Union Carbide Corporation. They also produce isotopes for distribution to pharmaceutical manufacturers and other industrial and commercial firms duly authorized to receive such byproduct materials.

B. Nuclear Facility.

The reactor - hot lab facility is located on the east slope of a rocky ridge and overlooks the Engineering

Building, Research and Administration Building, and Boiler House. Union Carbide owns 100 acres on which the facility is located. This area is approximately rectangular in shape and is bordered on the southeast by Long Meadow Road which provides access to the facility. The property is not fenced, but security is furnished by the Pinkerton Agency which provides periodic surveillance in the area and within the buildings. Union Carbide also has an option to buy 20 acres of land adjoining Long Meadow Road on the east and facing Union Carbide's facility.

The reactor and hot lab facilities are both contained partially above ground and partially below ground. They are physically connected above ground providing access between buildings for personnel. The transfer canal is primarily below ground-level and connects the pool of the reactor with the used fuel storage area in the loading dock area of the hot lab. This canal allows transfer of fuel elements under water to the storage area (also under water). Storage of fuel elements in this area is conducted under the Reactor Facility License No. R-81 (Docket No. 50-54).

If fuel elements are removed from the storage area to any other area except the reactor, it will be performed under the proposed licensing arrangement.

C. Hot Cells.

The hot laboratory consists of 5 hot cells, a charging area, an operating area, three radiochemistry laboratories, two loading docks, a decontamination room, a maintenance shop, a liquid waste holding and treatment room, a solution makeup area, and associated offices, supply and exhaust fan rooms, etc. Only four of the hot cells are presently in use. Cell 1 is an oversize cell with remote equipment available for transferring irradiated material from the canal into the cell and for removing specimens from heavily shielded shipping containers. Cell 4 presently contains a 3,500 curie sealed Cobalt 60 source used as an irradiator and covered by byproduct material License No. 31-3334-2.

This license presently allows possession of up to 24,000 curies of Cobalt 60 as sealed sources. Cells 2, 3, 4, and 5 are general purpose cells designed to accommodate a variety of operations. Main access to all cells is via the rear doors which are motor-driven and travel on steel rails located in the floor of the charging area. Access to the cells is controlled by an administrative procedure requiring authorization by Mr. Lieberman or his alternate. Part of this procedure requires the opening of two hasp-type locks before the motor can be actuated. An alarm sounds when any of these doors is opened.

Access to all cells is also possible via top roof openings containing removable plugs. There are also two charging sleeves, 4" in diameter, in the roof of each cell and a 6" diameter charging sleeve in the center of the roof plugs of each cell. Access via the roof is controlled by administrative procedure requiring authorization by Mr. Lieberman or his alternate. These roof plugs must be removed with a ten-ton overhead crane. In the front shielding wall of each cell there are removable plugs and sleeves providing access for remote handling equipment, periscopes, and services such as gas, air, etc. When the sleeves are not in use, they are filled with magnetite shielding plugs. Locking bars are used to prevent accidental removal of these plugs. There are similar sleeves and removable plugs in the rear cell walls and door. There is also an intercell conveyor system permitting transfer of samples between cells or from a shielded external loading station to any cell.

D. <u>Waste Treatment</u>.

The hot lab facility includes a radioactive waste water treatment system including an evaporator, condenser, and ion exchange system. The activity in these wastes is determined in the initial storage tank and after the water has passed through the ion exchange columns into the cold hold tanks. This system is designed for batch or continuous type operation. The waste water is then transferred to one of two 5,000 gallon collection tanks. These tanks also receive waste water from cold areas of the hot lab and reactor. The activity in these tanks is determined before release from the site. The result is that all radioactive liquid wastes are analyzed for activity three times before release and cold wastes are analyzed for activity once before release. The effluent appears in Indian Kill Creek <u>below</u> Indian Kill Pond. The owners of Sterling Forest sell water from Indian Kill Pond to Union Carbide for all uses including drinking, and water from this pond is also used for drinking water in the Laurel Ridge housing area. Indian Kill Creek flows into the Ramapo River which in turn flows into Newark Bay which flows into New York's Upper Bay via the Kill VanKull. Other ponds and lakes in the nearby area are not located in the same drainage system as Union Carbide.

B. <u>Radiation Monitors</u>.

There are 15 radiation monitors located in appropriate areas throughout the hot lab. One monitor is located in each hot cell. Each unit has a range from zeroto 10 r/hr. All units, except those inside the cells, are normally set to alarm at 5 mr/hr. Each monitor has audio and visual alarms at the unit as well as at the main monitor control panel in the operating area of the hot lab.

There are two constant air monitors located in the hot lab. One is in the charging area behind the hot cells and the other is on the second floor above the hot cells.

The exhaustair from the stack is continuously monitored on the downstream side of the filters for gaseous and particulate activity. This monitor normally measures the combined effluent activity from the reactor and the hot lab but can be switched to either effluent as necessary. This monitor <u>will not</u> detect alpha activity.

There are three permanent monitoring stations in the area surrounding the facility. Particulate matter is collected on filter paper samples at each location. These samples can be counted for alpha and/or beta gamma activity.

F. Ventilation System.

The hot lab facility has a ventilation system that is pressure regulated to maintain a continuous positive flow of air from non-radioactive areas to contaminated areas. Three supply fans supply 30,000 ft^3/min to the various areas and the exhaust fan operates at 30,000 ft^3/min. The system is interlocked such that if the exhaust system fails, the air supply system will cut off. The exhaust system can operate on emergency power (gasoline-driven generator) at half speed. An emergency fan with a capacity of 8,000 ft^3/min can operate on either normal or emergency power. The building will be maintained at -0.2" (water gauge) with respect to the environment. Hot cells will be maintained at from -0.5" to -0.9" with respect to the operating and charging areas. However, it was noted during our visit that pressure differentials as high as -1.75" existed at the hot cells.

All exhausts from areas where radioactive materials are handled pass through a prefilter and a high efficiency filter. Although not presently installed, high efficiency filters and prefilters will also be installed in each hot cell before the expanded program becomes effective. In addition, all exhaust air passes through activated carbon units and all exhaust air from the iodine processing cell passes through a second activated carbon unit before release.

III. Miscellaneous Information.

A. There is a wind speed and direction indicator at the stack which reads out in the Reactor Control Room. These items are logged only two hours during reactor operations. As a result of our discussion, Union Carbide will immediately institute a procedure whereby these values will also be logged every two hours if the hot lab is operating while the reactor is shut down.

B. The relatively high possession limits will be used both for research and development and in some cases for packaging and transfer to licensed recipients. The sealed Pm-147, Cs-137, Ce-144, Sr-90, and Nb-95 may be used for development of SNAP-type devices. If so, the sealed sources will be purchased and not fabricated.

C. All work with alpha emitters in the Radiochemical Laboratory will be done in glove boxes.

D. There will be <u>no</u> processing of spent fuel elements.

E. Union Carbide does not anticipate any work at the hot lab at any time other than during normal daytime working hours.

F. Contamination has been found on the rear cell door wheel rails and troughs. A careful check and control is maintained on this source of contamination.

G. The cover hatch in Cell 1 allowing transfer of fuel elements from the canal to the cell is approximately 2½ feet above the floor level of the cell. Contaminated water arising from within the cell would not likely flow back to the canal. In any event, the canal water is normally contaminated to some extent.

IV. <u>Conclusions</u>.

Union Carbide has adequately described their facility and proposed operations. They have postulated several maximum credible accidents for various isotopes and forms. They have included an evaluation of the shielding characteristics of the hot cells. Their calculations indicate that radiation levels at the exterior of the cell wall will be less than 2 mr/hr from approximately 420,000 curies of mixed fission products or from 1.1×10^6 curies of Cobalt 60. Union Carbide has requested a total of 315,000 curies of byproduct materials in various forms and 420,000 curies as mixed fission products. Thus, it is concluded that the shielding is adequate for these possession limits.

The calculations for Union Carbide's maximum credible accidents have been verified as have all other calculations pertinent to the application. These calculations show that air concentrations in unrestricted areas resulting from release of material from the stack, as postulated in several maximum credible accidents, would be less than 40% of the applicable air concentrations listed in Appendix B, Table II, of 10 CFR 20 when averaged over a one-year period.

Union Carbide has a competent staff at this facility with considerable experience in the use and handling of byproduct materials. All personnel receive on-the-job training supplemented by formal courses on radiation safety.

The facility possesses ventilation systems, a radioactive waste water treatment system, decontamination system, and vessel off-gas system adequate for the proposed program. The facility also has adequate personnel and maintenance facilities.

There are constant air monitors, portable samplers, fixed area radiation monitors, and portable survey meters available for use in determining radiation levels and air concentrations of radioactive materials.

I find that the applicant's equipment and facilities are adequate and the applicant is qualified by training and experience to use the material for the purpose(s) requested in such manner as to protect health and minimize danger to life or property and therefore propose to issue the license.

cc: Don Nussbaumer